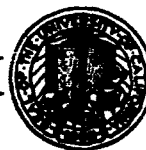


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January 7, 1966

To: Miss Winnie Morgan
Technical Reports Officer
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Washington, D. C. 20546

From: H. C. Urey and Bartholomew Nagy

Re: Semi-Annual Report, NASA Grant NsG-541

The research conducted during the period May-November, 1965, consisted of three basic aspects of investigations.

1. The organic matter, insoluble in common organic solvents, has been studied in bituminous coal, in a Devonian sedimentary rocks, and in the Orgueil carbonaceous meteorite. The study of this natural, "random-type polymeric" substance has been performed by the ozonolysis technique that has been developed during the course of these studies, and which has been described in detail in the last semi-annual progress report. For a brief review, the method consists of treating the solvent extracted samples with alkaline H_2O_2 and then with O_3 in a KOH suspension. This is followed by further oxidation with H_2O_2 acidification and the preparation of methyl esters. The building units of the "polymer" are identified by preparative gas-chromatography followed by spectroscopic analyses. By using this technique during the period of May-November, 1965, it was found that the shale kerogen was dissimilar in its chemical character to coal and the Orgueil meteorite "polymeric" material. However, more sedimentary rock samples will have to be analyzed before this relationship can be firmly established.

2. Optical rotatory dispersion studies were conducted on a large number of lipid extracts from soils, Recent marine sediments, sedimentary rocks and of the Orgueil meteorite. A Bendix Polarmatic Recording Spectropolarimeter has been used in this study. This instrument has been calibrated with solutions of known optical rotations and in addition has been calibrated against a Cary, Model 60 Recording Spectropolarimeter. Small rotations had been observed in most samples, involving both levo and dextro rotations. It was noted that lipid extracts obtained from samples that were subjected during the geological past to some metamorphic processes did not show optical activity. This may also point out that the optical rotation observed in the other samples was not caused by laboratory contaminations. The Orgueil meteorite lipid fraction did show a small levo rotation, as it was reported earlier.

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3. Lipid extracts of soils, Recent marine sediments, and sedimentary rocks have been studied extensively by thin-layer chromatography and by spectrometric methods of analysis. The object of this study was to try to determine possible differences in lipid compositions under different environmental conditions. Present tentative results suggest that soil and marine sediment lipid compositions are generally different and that lipids extracted from sedimentary rocks vary considerably from one sample to another.

Further investigations along these lines will be conducted with emphasis on the study of sedimentary rock and carbonaceous meteorite "polymeric" organic matter.

Harold C. Urey.
Harold C. Urey

B. Nagy
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